6.6. North Puget Sound/San Juan Island Fish and Shellfish Data

North Puget Sound Geographic Response Plan Workshop

Sensitive Species Information

The following maps (draft) represent the current knowledge of some of Washington Department of Fisheries' (WDF) trust resources. The maps focus on nearshore resources of high commercial, recreational, or ecological value. **Adult and juvenile life stages of a number of ecologically and economically important species including salmon, marine fish, baitfish, and shellfish as well as the plankton community are considered to be ubiquitous in distribution and therefore, are not displayed on maps.** Pertinent information on many of these species can be found in the habitat association and timing tables which include information on temporal and spatial distribution, preferred habitat, and relative abundance of various life history stages. This information must be considered in resource protection and damage assessments efforts.

Additional areas of resource occurrence are continually being documented. The extent of intertidal spawning habitat represented in the baitfish maps for surf smelt and Pacific sand lance is updated annually as new spawning areas are documented.

The shellfish maps do not offer complete information on intertidal and subtidal shellfish resources. Surveys run by WDF have been oriented to locating beds that could be commercially harvested. Many intertidal areas are privately owned tidelands upon which WDF has not undertaken a comprehensive inventory of the naturally produced or cultured shellfish resources. No attempt has been made on these maps to differentiate between areas which have not been surveyed and those in which shellfish were not found in commercial quantities.

Due to a combination of new data and incomplete data it is not safe to assume that blank areas on the maps are not of concern. If you have any questions regarding this information please contact the WDF Spill Response and Damage Prevention Unit at 206-902-2570.

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Pacific Salmon

Resource Information Mapped: Anadromous streams and rivers utilized by one or more of the following species for spawning and rearing: chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), sockeye (*O. nerka*), chum (*O. keta*), and pink (*O. gorbuscha*).

Resource Use: Human; extensive commercial and recreational fisheries. Non-human; the list of predators on the various life history stages of salmon is extensive and includes several species of birds (bald eagle), fish, marine mammals, and terrestrial mammals.

General Location or Habitat Association of Resource: Salmon spawn and rear in all major Washington watersheds and in many of the smaller tributaries. Salmon are anadromous in that they begin life in fresh water, spend the largest portion of their life in salt water, then return to fresh water to spawn. There is a broad range of life history types both between and within the species. Both juvenile and adult salmon are present year round throughout this region.

Seasonal Sensitivity: Varies with species, stock, and river system. See habitat association and timing table.

Recommended Protection Strategy: In the estuaries contain and recover oil in the main channels as close to the entrances as possible or divert to shore based recovery points. Keep oil off of the intertidal flats. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum or transport it into the lower intertidal or subtidal zones. Along the coast boom the river and stream mouths.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Fish Resources

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Rockfish (Sebastes spp.)

Resource Information Mapped: Critical juvenile (young-of-the-year) rockfish habitat.

Resource Use: Human - rockfish are an important commercial and recreational species complex. Non-human - Rockfish are utilized as food organisms by various marine fish species including lingcod and by marine mammals.

General Location or Habitat Association of Resource: High densities of juvenile rockfish are found in nearshore eelgrass and kelp beds. In kelp beds fish are often found within 50 cm of the surface. These habitats are critical to their survival, providing protective cover as well as food. All the eelgrass and kelp beds within the region may provide juvenile habitat. Areas of particular interest include the mixed eelgrass and kelp (*Laminaria* sp.) beds in Short Bay and Alice Bight on Burrows Island and along the north shore of Young Island.

Seasonal Sensitivity: High densities of juvenile rockfish are found in the eelgrass and kelp beds from June through September.

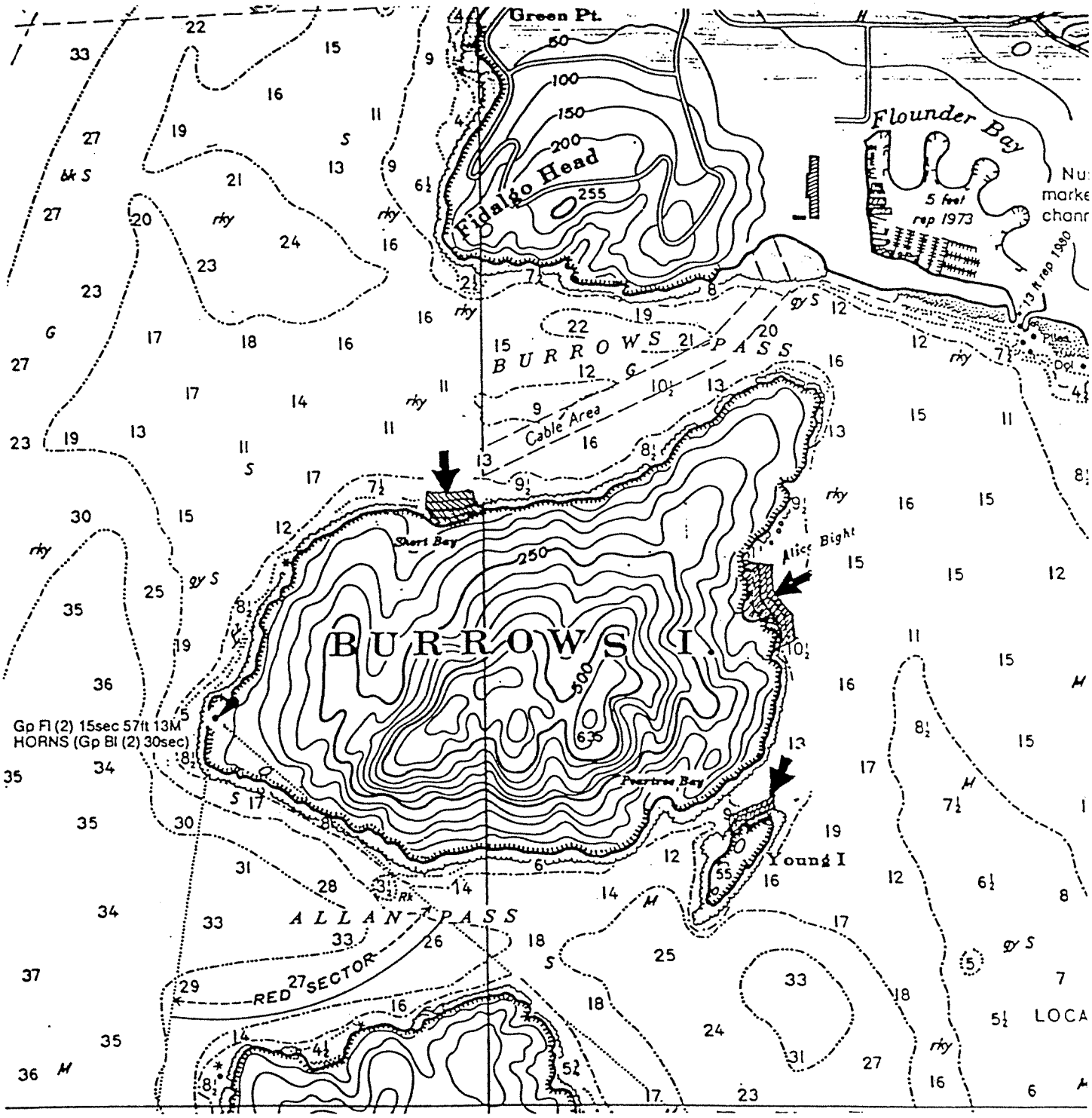
Recommended Protection Strategy: Prevent oil from entering or penetrating into the kelp and eelgrass beds. The beds mentioned above are a high priority for protection. They are small enough that exclusion or deflection booming may protect them.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit and Marine Habitat Investigations Unit

References:

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Fish Resources



Juvenile Rockfish Rearing

Source: Washington Department of Fisheries

This map does not offer complete information on fish and shellfish resource distribution. Comprehensive inventories have not been completed along all shorelines

June 14, 1993

Northern Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Pacific Herring (*Clupea harengus pallasi*)

Resource Information Mapped: Adult prespawning holding areas and spawning areas.

Resource Use: Human; Strait of Georgia sac-roe and roe-on-kelp fisheries, sport bait fishery targets juvenile fish. Non-human; one of the most important components of the marine food chain; they provide the link between primary production and upper level predators. All life history stages utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

General Location or Habitat Association: Adult prespawning holding areas are located in the Strait of Georgia, Bellingham Bay, Samish Bay and Padilla Bay. Fish are found in pelagic schools. In this region herring spawning occurs at Point Roberts, continuously from Drayton Harbor south to Lummi Bay, Hale Pass, Samish Bay, northern Padilla Bay, and Fidalgo Bay. Herring deposit their eggs on marine vegetation, such as eel grass or algae, within the shallow subtidal and intertidal zones.

Seasonal Sensitivity or Occurrence: Adult herring congregate in relatively distinct areas during December through June prior to spawning. Exposure of pre-spawning adults to oil can result in the accumulation of hydrocarbon compounds in the yolk of maturing eggs. Metabolism of these compounds during embryonic and larval stages can result in lethal and sublethal genetic, cellular and morphological injuries. Spawning occurs from February through mid-June in the Strait of Georgia, February through mid-April in Samish, Padilla and Fidalgo Bays. Eggs hatch after approximately 10 days. Larvae and subsequent juvenile fish are found in nearshore areas throughout the following summer. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

Recommended Protection Strategy: Boom off Drayton Harbor, and southern Fidalgo Bay. Utilize open water collection techniques to keep oil off of the spawning substrate throughout the region.

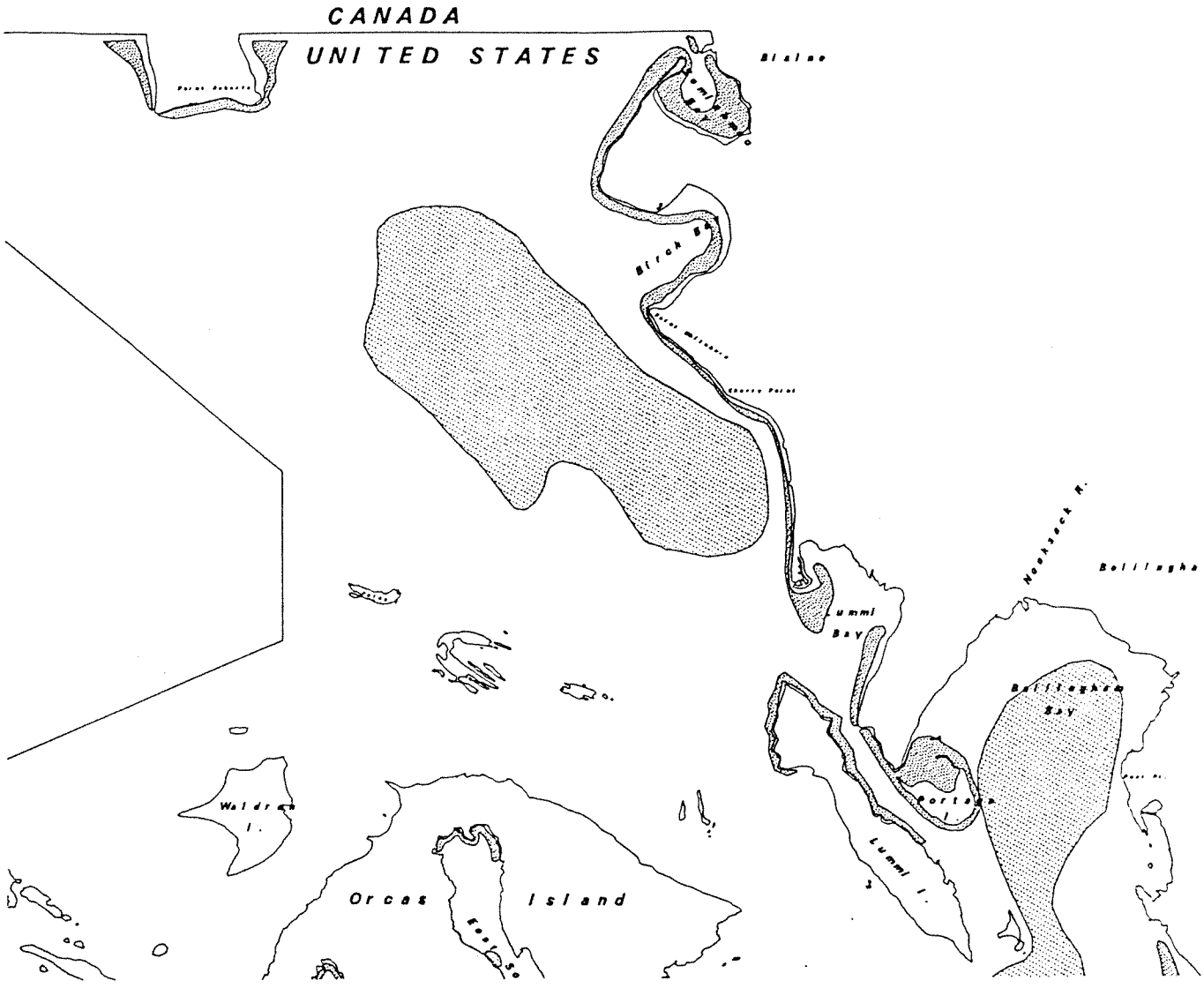
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Baitfish Resources
Whatcom County



Herring Spawning

Herring Holding

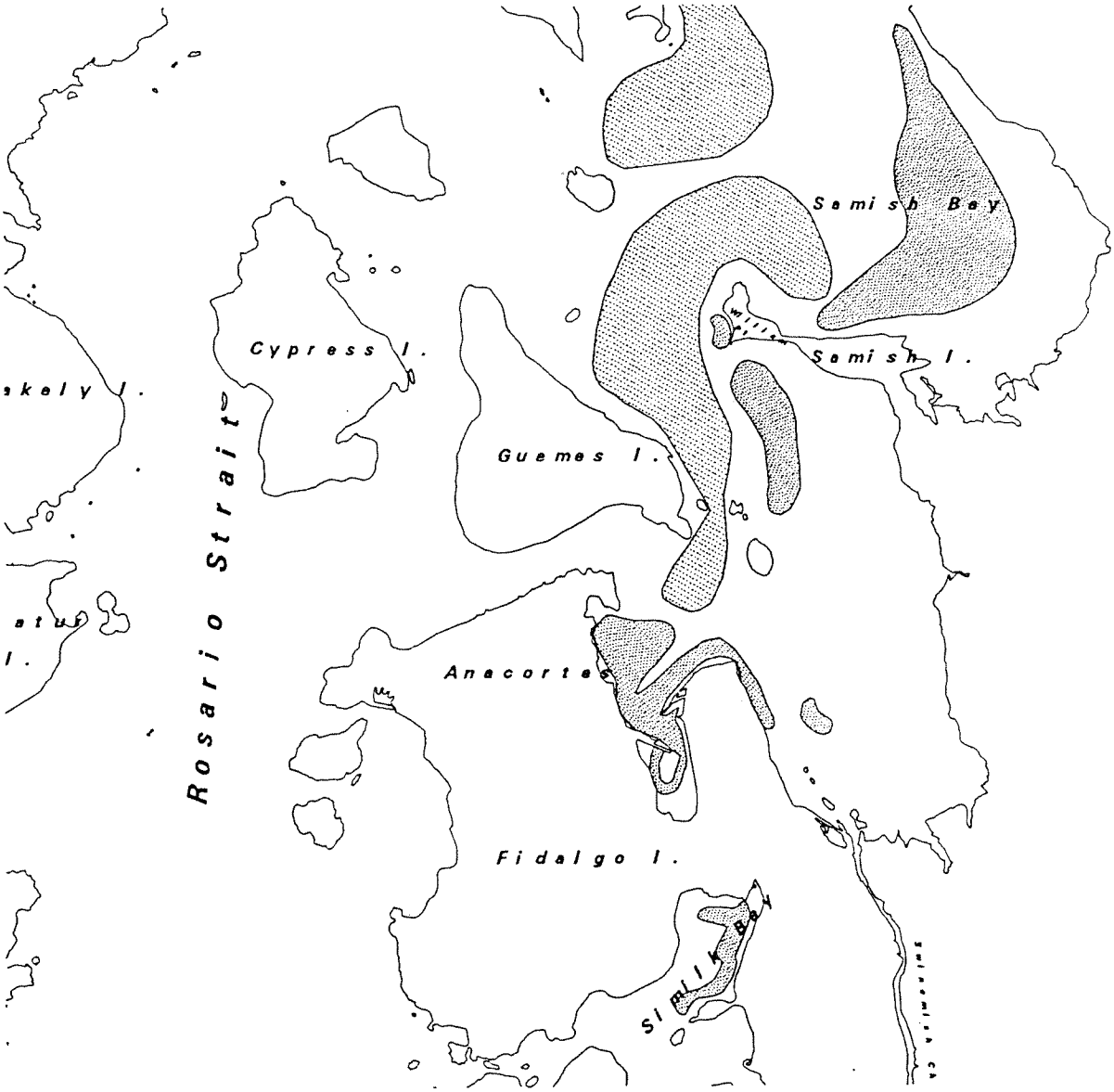
USGS Shoreline

Meters

0 7000 14000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

North Puget Sound Baitfish Resources
Skagit County



Herring Spawning

Herring Holding

USGS Shoreline

Meters
0 4000 8000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

December 6, 1994

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Surf Smelt (*Hypomesus pretiosus*)

Resource Information Mapped: Intertidal surf smelt spawning areas.

Resource Use: Human - commercial and recreational harvest. Non-human - important component of the marine food chain; smelt provide the link between primary production and upper level predators. All life history stages are utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

General Location of Sensitive Resource: Surf smelt deposit their eggs in the uppermost intertidal zone on gravel generally having a grain size from 1 to 7 mm. Incubation takes 2 - 4 weeks. Larvae are found in adjacent nearshore surface waters for several weeks following hatching. Spawning areas exist from Drayton Harbor south to Birch Bay Marina, Cherry Point to Neptune Beach, Samish Island and Fidalgo Bay. Other undocumented spawning areas are suspected in the region.

Seasonal Sensitivity or Occurrence: Surf smelt spawning in the Birch and Cherry Point area occurs from June through September. Spawning occurs in Fidalgo Bay from October through March and possibly year around. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

Recommended Protection Strategy: Keep oil off of spawning beaches regardless of season. Utilize protective booming where possible (Fidalgo Bay) and aggressive open water collection techniques elsewhere.

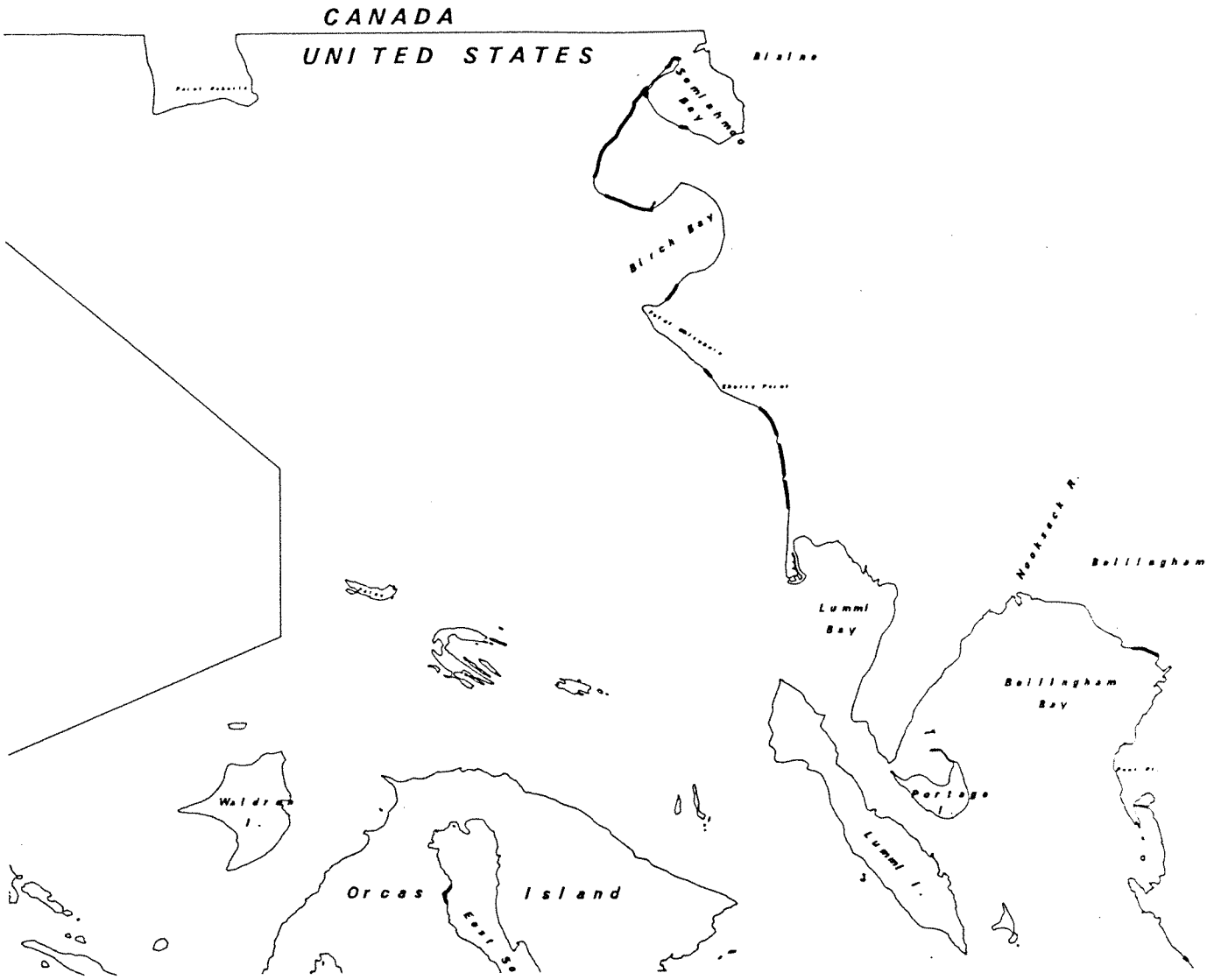
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Baitfish Resources
Whatcom County



Smelt Spawning

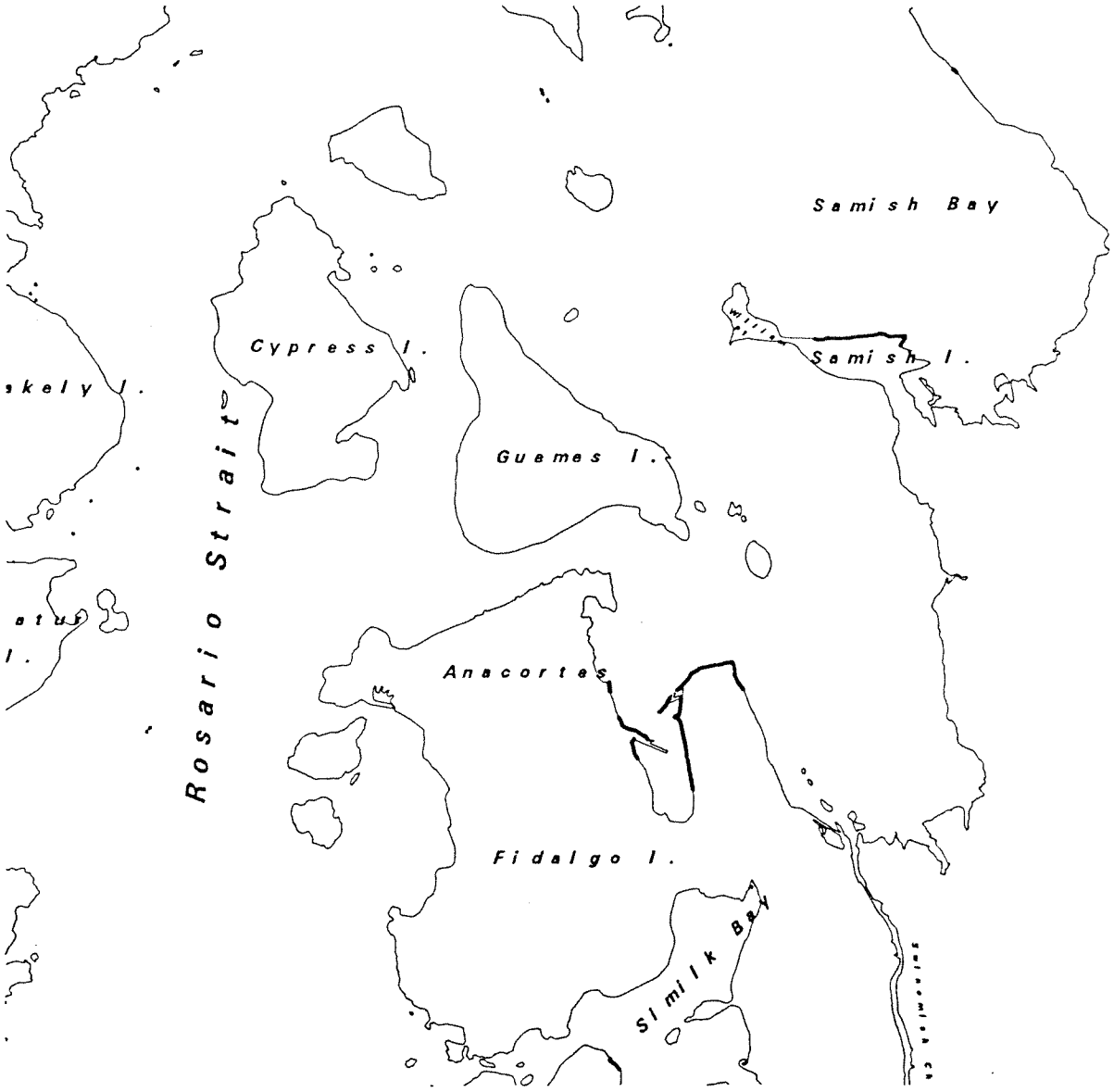
USGS Shoreline

Meters

0 7000 14000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

North Puget Sound Baitfish Resources
Skagit County



Smelt Spawning

USGS Shoreline

Meters

0 4000 8000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Pacific Sand Lance (*Ammodytes hexapterus*)

Resource Information Mapped: Documented intertidal spawning areas and larval rearing areas.

Resource Use: Human - sand lance are used as bait by recreation fishers. Non-human - important component of the marine food chain; sand lance provide the link between primary production and upper level predators. All life history stages are utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

General Location or Habitat Association of Resource: Pacific sand lance spawn from November through February and deposit their eggs on upper intertidal sandy-gravel beaches. Documented spawning areas in the region include the east shore of Point Roberts, Drayton Harbor, Gooseberry Point, Samish Bay, Samish Island and Padilla Bay. Sand lance larvae are widespread in the regions near-surface waters from January through March. It is suspected that additional spawning and larval habitat exists within the region. Adult sand lance are found in nearshore habitats throughout the region.

Seasonal Sensitivity: The highest sensitivity is during the spawning and larval stages from October through March. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

Recommended Protection Strategy: Keep oil off of spawning beaches regardless of season. Utilize protective booming where possible (Drayton Harbor) and aggressive open water collection techniques elsewhere.

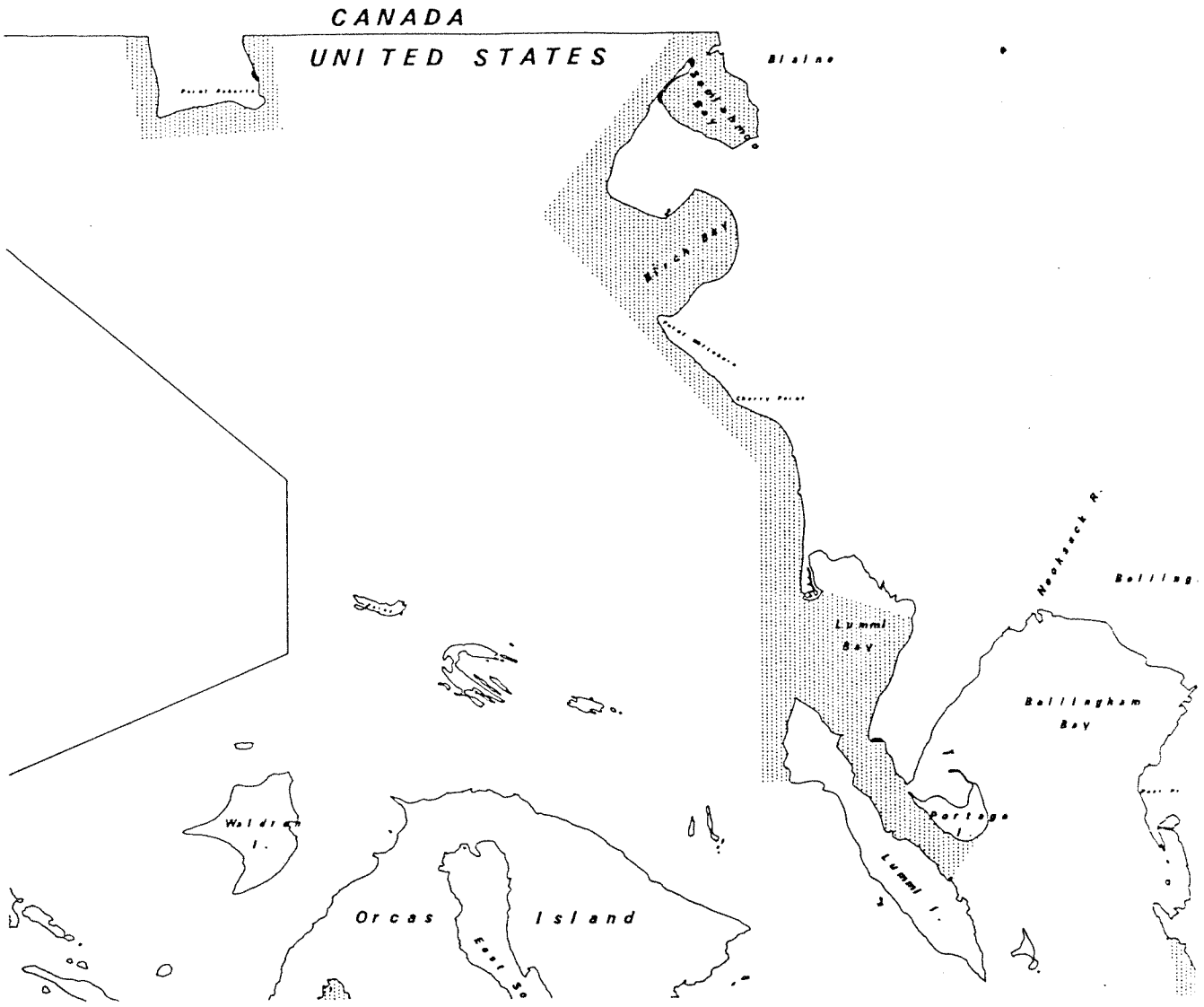
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Baitfish Resources
Whatcom County



Sand Lance Spawning

Sand Lance Larvae

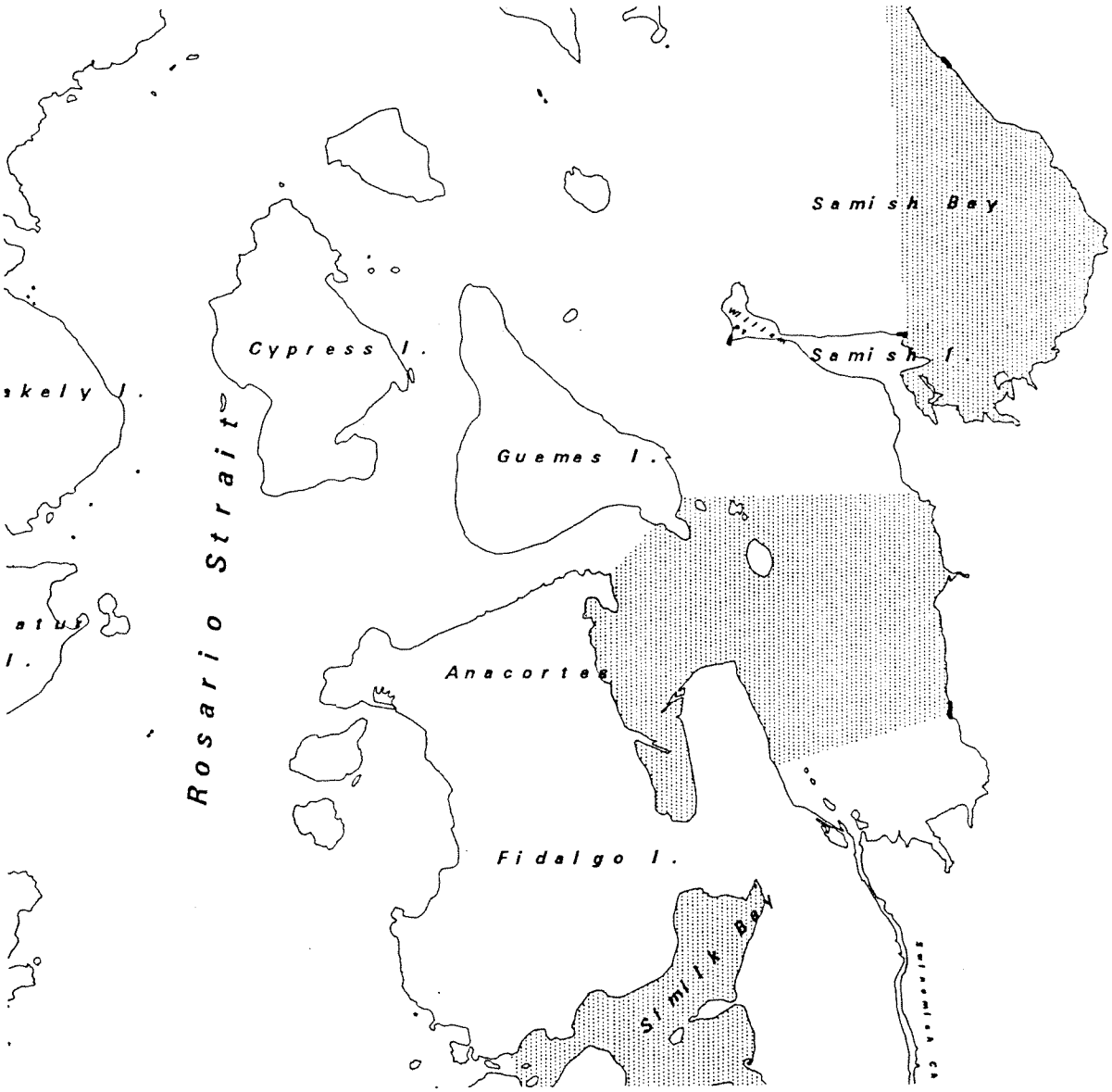
USGS Shoreline

Meters

0 7000 14000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

North Puget Sound Baitfish Resources
Skagit County



Sand Lance Spawning

Sand Lance Larvae

USGS Shoreline

Meters

0 4000 8000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources.

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Cancer Crab

Resource Information Mapped: Dungeness (*Cancer magister*) and red rock (*C. productus*) crab distribution. Map depicts primarily adults but does cover some juvenile areas. Important juvenile habitat will correlate with the herring spawning (eelgrass) and oyster areas (see appropriate maps).

Resource Use: Human - large commercial and recreational harvest. Non-human - all life history phases are utilized as food by numerous fish species (eg. Pacific herring, lingcod, rockfish, coho and chinook salmon, halibut, English sole and cabezon), octopus, sea otters, harbor seals, sea lions, and gulls.

General Location or Habitat Association of Resource: Cancer crab are found throughout the region. Adults are found from the intertidal to -90 m MLLW and prefer sandy substrates. Juveniles are found intertidally and typically associated with eelgrass, ulva, bivalve shells, or some form of cover, from +3 to -15 m MLLW. Larvae and megalopae are planktonic. Megalopae are typically found in nearshore waters where they settle to the bottom and metamorphose into juveniles during summer. Females carry incubating eggs beginning in the fall and hatching occurs between February and April.

Seasonal Sensitivity: Larvae/megalopae - planktonic - March through July. Juveniles - epibenthic intertidal - year-round.

Recommended Protection Strategy: Protect nearshore juvenile habitat, particularly eelgrass beds. Utilize protective booming where possible (Drayton Harbor and Fidalgo Bay) and aggressive open water collection techniques elsewhere.

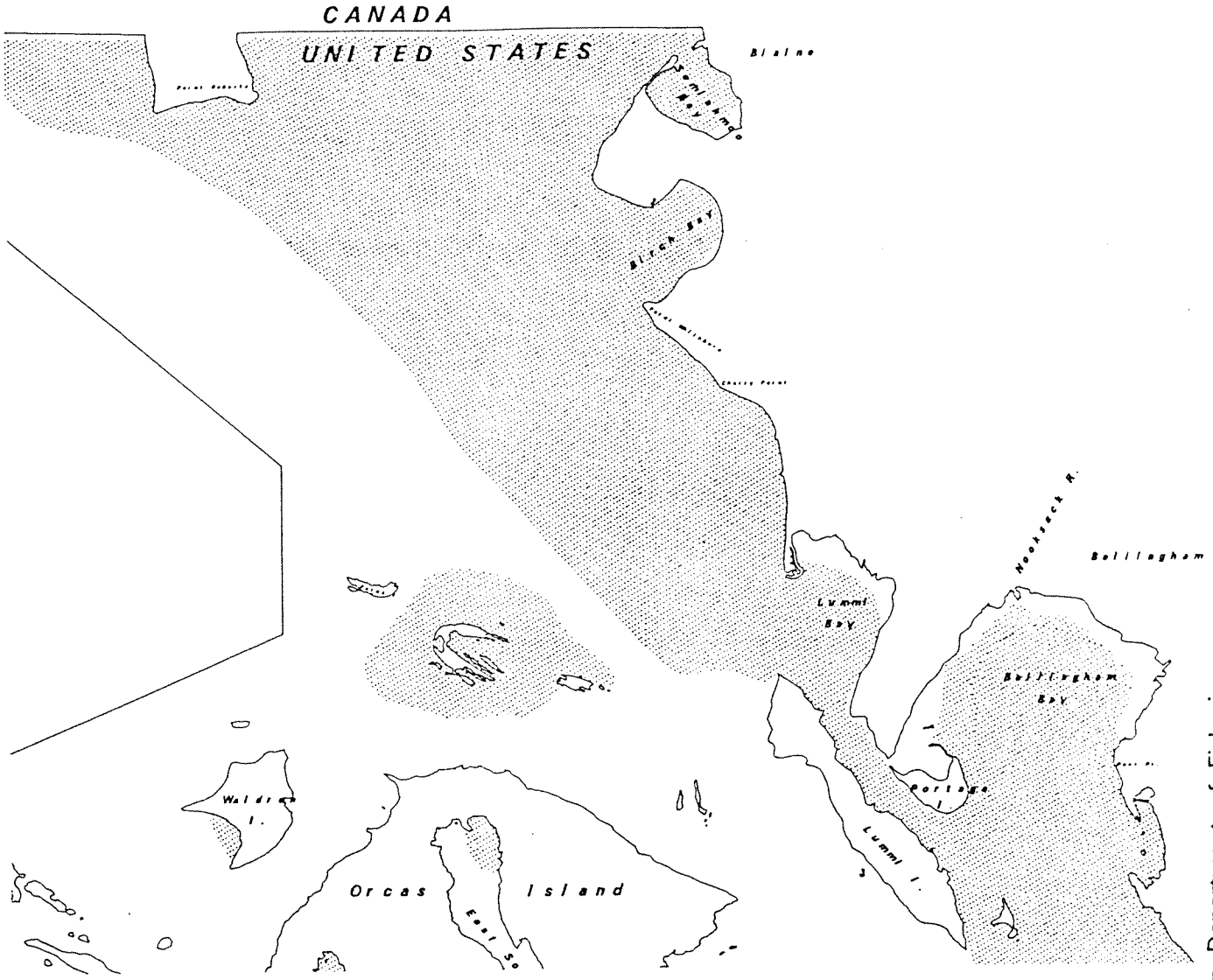
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Shellfish Resources
Whatcom County



Cancer Crab

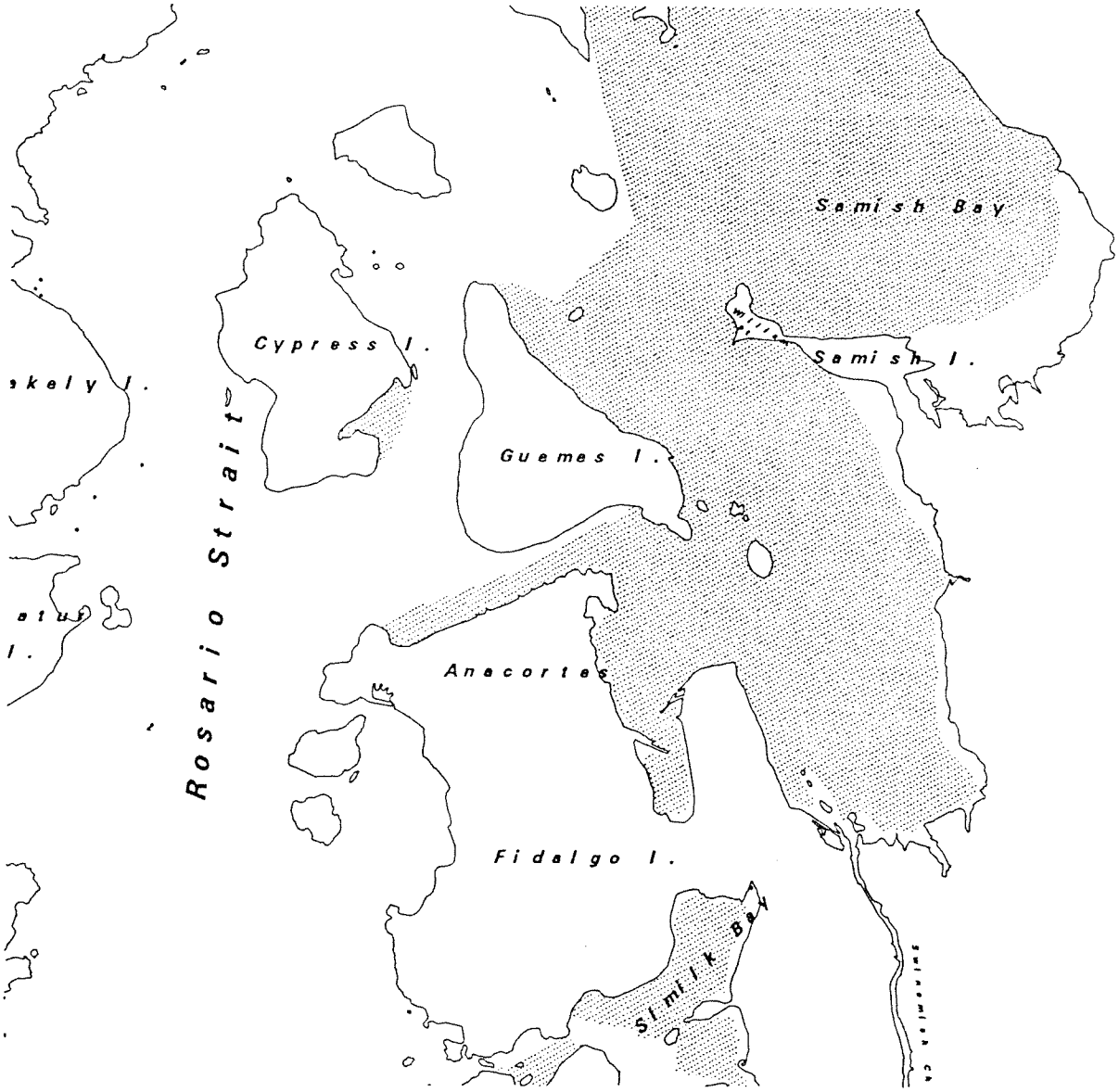
USGS Shoreline

Meters

0 7000 14000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

North Puget Sound Shellfish Resources
Skagit County



Cancer Crab

USGS Shoreline

Meters
0 4000 8000

Source: Washington Department of Fisheries
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June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Intertidal and subtidal hardshell clams, and intertidal softshell clams.

Resource Information Mapped: Hardshell intertidal include the native littleneck (*Protothaca staminea*), the Manila littleneck (*Tapes philippinarum*), butter clams (*Saxidomus giganteus*), piddock clams (*Zirfaea pilsbryi*), and horse clams (*Tresus capax* and *T. nuttallii*), and cockles (*Clinocardium nuttali*). Subtidal includes butter clams, piddock clams and horse clams. Softshell intertidal includes only the eastern softshell clam (*Mya arenaria*).

Resource Use: Human; commercial and recreational harvest. Non human; as a group clams are feed upon by a wide variety of organisms including snails, sea stars, Dungeness and rock crabs, several species of commercially and recreationally import fish, sea otters, raccoons, scoters and other birds.

General Location or Habitat Association of Resource: Clams are found throughout the region with higher concentrations in Point Roberts, Tongue Point south to Point Whitehorn, Portage Island area, east Guemes Island, and March Point. Clams are found from approximately +2 m MLLW in the intertidal zone to subtidal depths of -21 m MLLW.

Seasonal Sensitivity: Due to their sessile lifestyle in the intertidal zone clams are at high risk of exposure throughout the year. Sensitivity would be elevated during the spawning and larval period which can extend from April through October.

Recommended Protection Strategy: Utilize protective booming where possible (Drayton Harbor) and aggressive open water collection techniques elsewhere. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum.

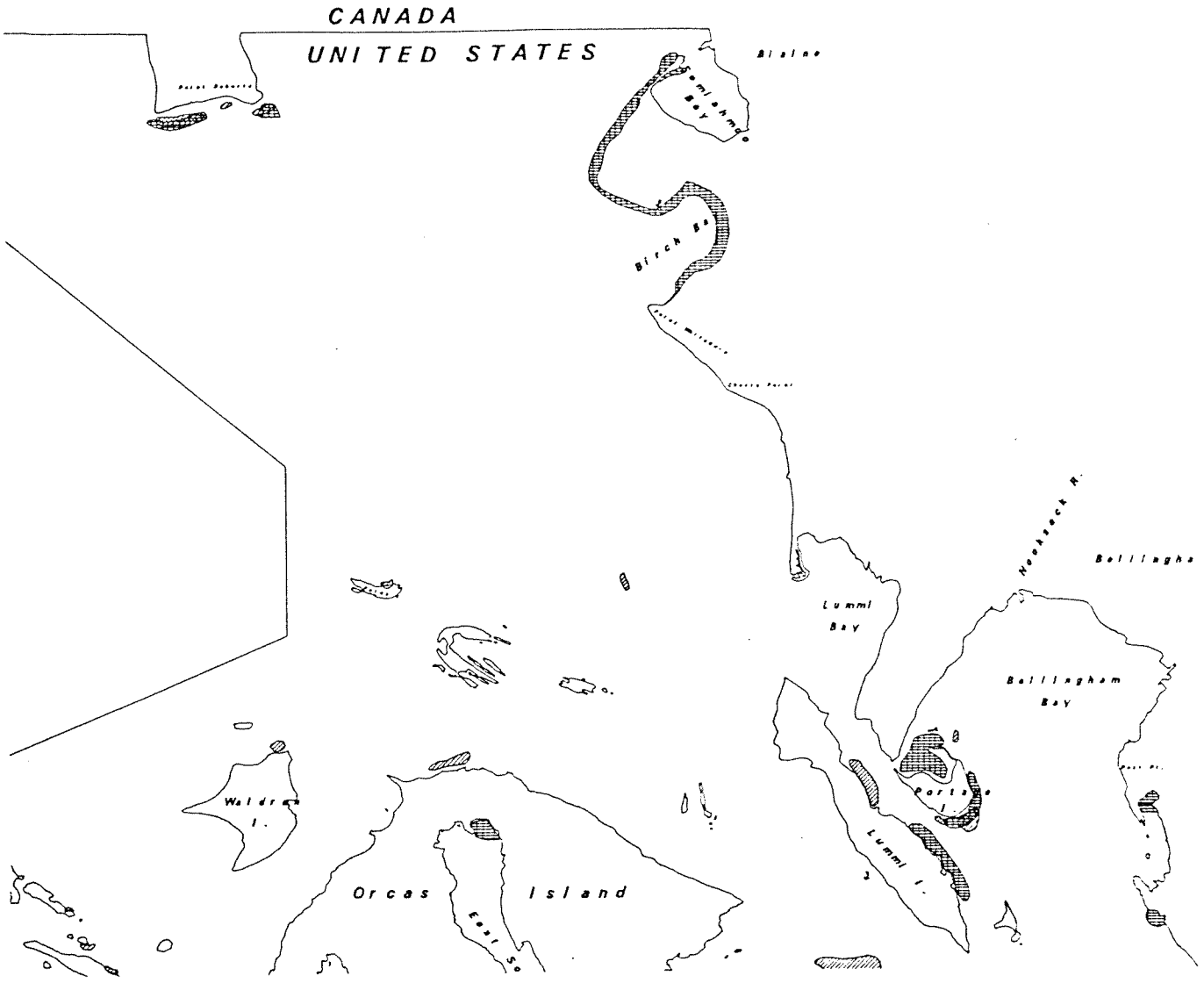
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Shellfish Resources
Whatcom County



Source: Washington Department of Fisheries
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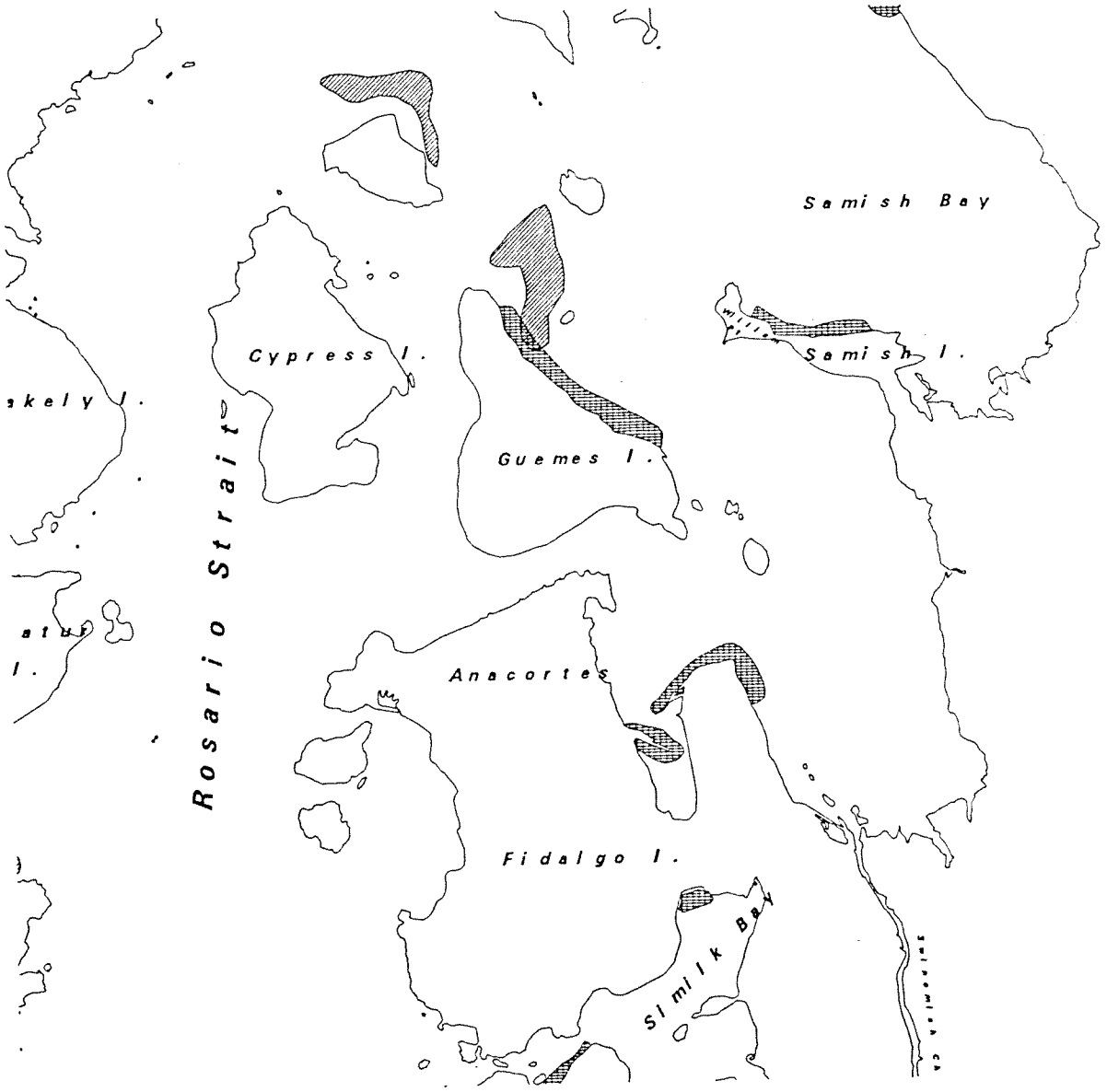
North Puget Sound Shellfish Resources
Skagit County



Subtidal Clam

Hardshell Clam

USGS Shoreline

Meters
0 4000 8000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Pacific Oyster (*Crassostrea gigas*)

Resource Information Mapped: Oyster beds, primarily cultured.

Resource Use: Human - recreational and commercial harvest. Non-human - Oyster beds provide important habitat for juvenile dungeness crab. Juvenile and adult oysters are preyed upon by dungeness and red rock crab, several starfish species, and surf and white-winged scoters.

General Location or Habitat Association of Resource: Pacific oysters are found in the lower intertidal and shallow subtidal zones in Lummi Bay.

Seasonal Sensitivity: Due to their sessile lifestyle in the intertidal zone oysters are at high risk of exposure throughout the year. Relative to their habitat function for juvenile dungeness crab the most sensitive period would be June through December.

Recommended Protection Strategy: Utilize protective booming where possible and aggressive open water collection techniques elsewhere.

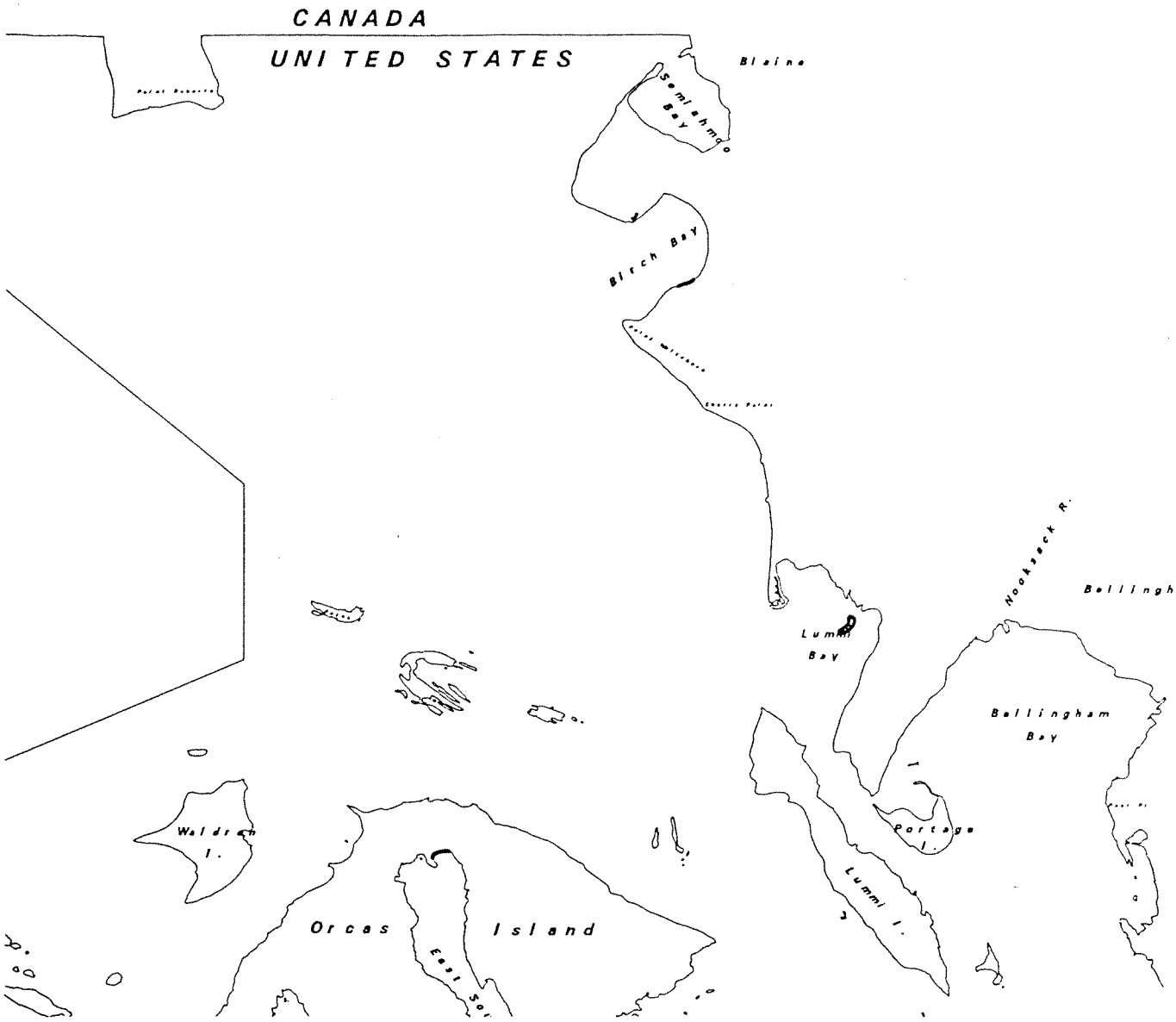
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Shellfish Resources
Whatcom County



Oyster

USGS Shoreline

Meters

0 6000 12000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

December 6, 1994

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Pandalid Shrimp

Resource Information Mapped: Harvest areas for four species of shrimp including; pink (*Pandalus jordani* and *P. borealis*), coonstripe (*P. danae*), and spot prawn (*P. platyceros*).

Resource Use: Human - commercial and recreational fisheries in the Strait of Georgia, Bellingham Bay, and Burrows Bay. Non-human - food organism for many fish species including rockfish, cabezon, and perch.

General Location or Habitat Association of Resource: Most harvest occurs in waters 100 to 220 m deep, however, the coonstripe and spot prawn are found as shallow as the lower intertidal zone.

Seasonal Sensitivity: Planktonic larval phase from February through July.

Recommended Protection Strategy: Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

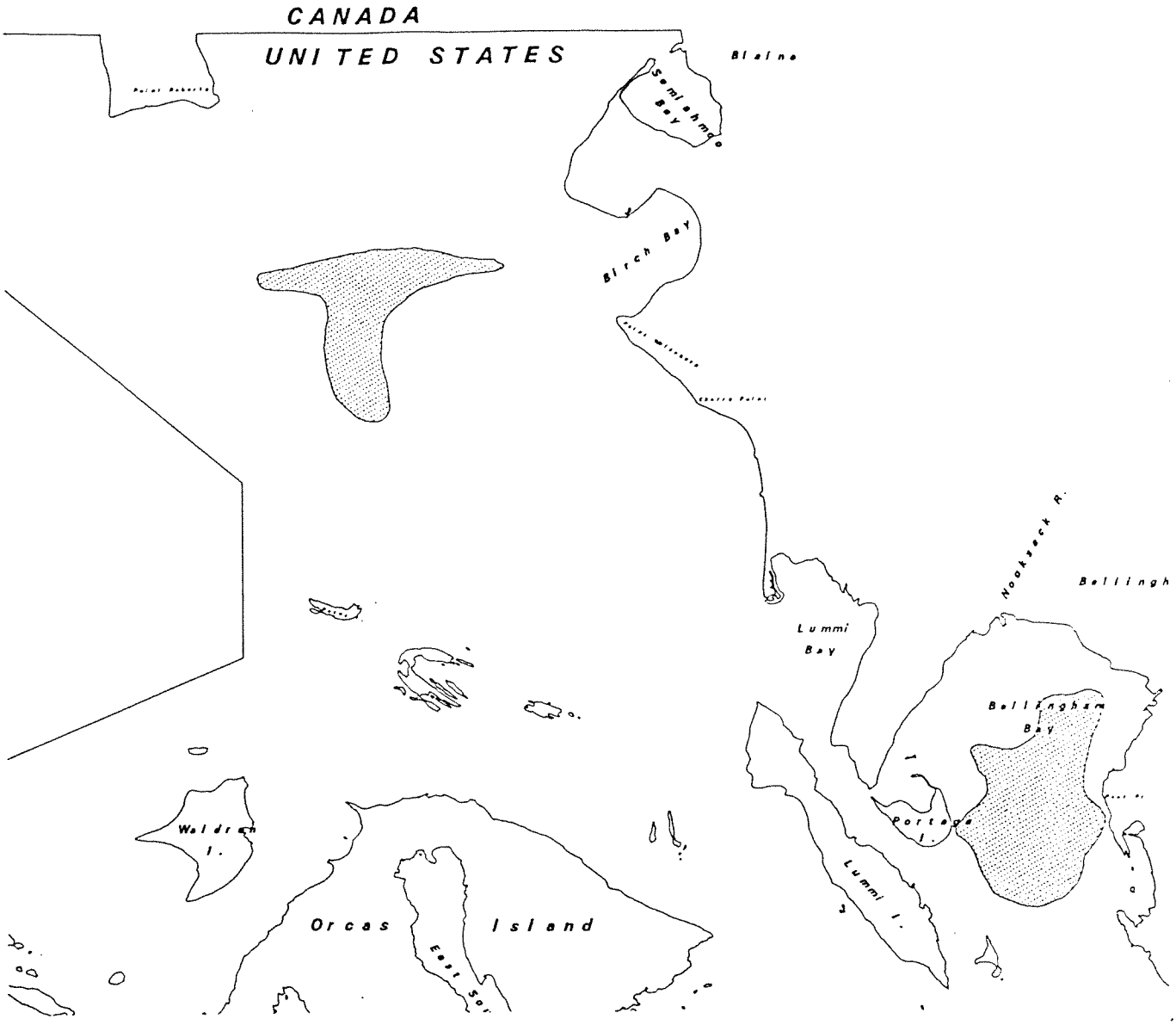
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

Hueckel, G.J. 1980. Foraging on an artificial reef by three Puget Sound fish species. Wa. Dept. Fish. Tech. Rpt. 53. 110 p.

North Puget Sound Shellfish Resources
Whatcom County



Pandalid Shrimp

USGS Shoreline

Meters

0 6000 12000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

North Puget Sound Shellfish Resources
Skagit County

Pandalid Shrimp

USGS Shoreline

Meters
0 4000 8000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Northern Abalone (*Haliotis kamtschatkana*)

Resource Information Mapped: Documented areas of abalone presence.

Resource Use: Human - recreational fishery only. Non-human - important prey item for sea otters, octopus, and cabezon.

General Location or Habitat Association of Resource: Abalone are found along exposed or semi-exposed bedrock or boulder shorelines from the intertidal zone to depths of 20 m. Within this region they are found around Cypress, Burrows, Allen and Fidalgo Islands.

Seasonal Sensitivity: Adult abalone congregate in the shallow subtidal zone to spawn from April through June. Abalone broadcast eggs and sperm into the water column and fertilized eggs sink to the bottom and hatch within days. Larvae spend 5 to 6 days as free swimmers in the water column. Adults are susceptible to oil exposure via ingestion of contaminated marine algae, particularly kelp. Highest risk of this type of exposure is from April to November.

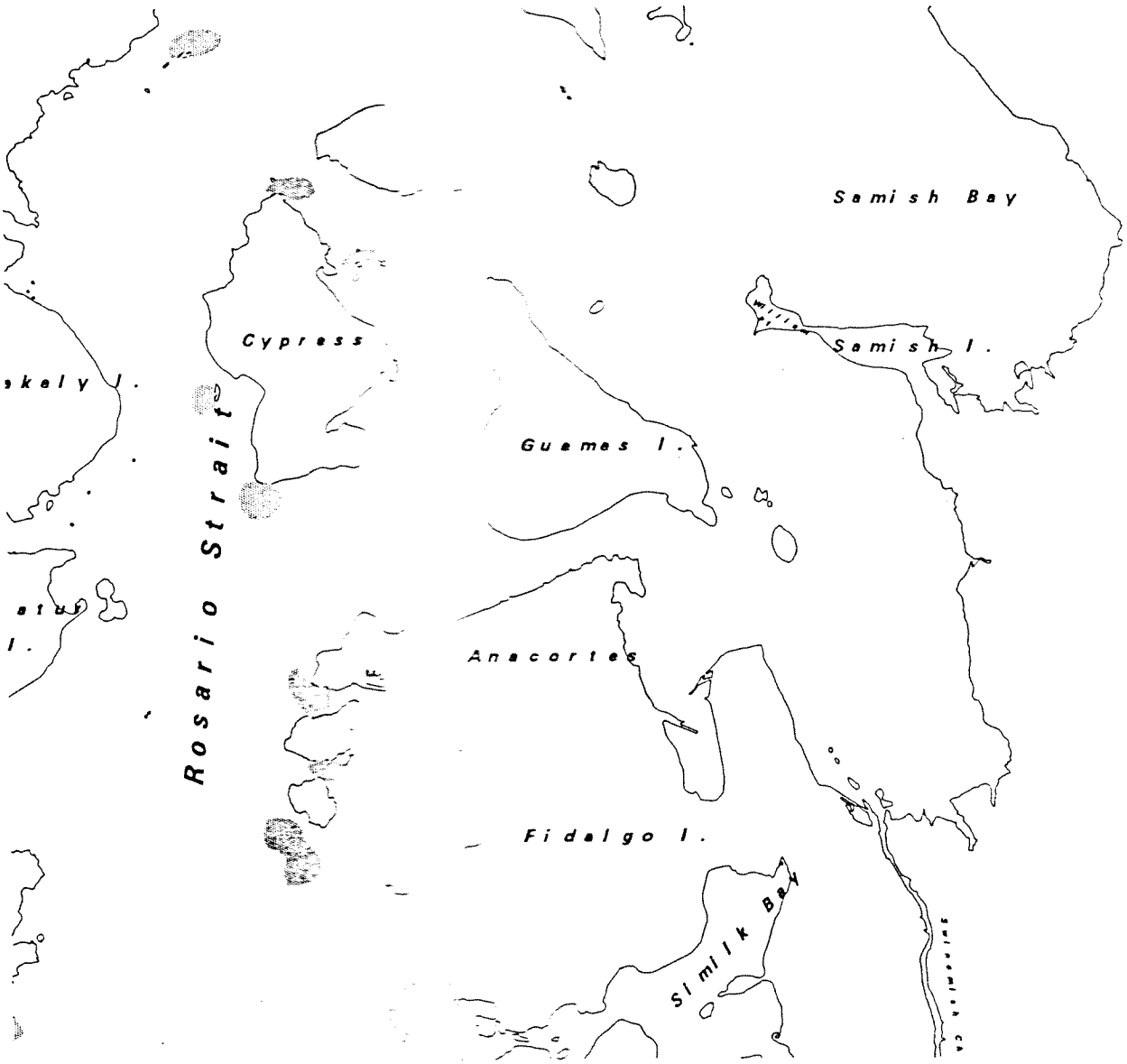
Recommended Protection Strategy: Prevent oil from contaminating nearshore kelp beds. Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Shellfish Resources
Skagit County



Abalone

USGS Shoreline

Meters

0 4000 8000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

Draft -

June 14, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Sea Urchin

Resource Information Mapped: Commercial quantities of adult sea urchins, primarily the red sea urchin (*Strongylocentrotus franciscanus*).

Resource Use: Human - commercial fishery. Non-human - dominant organism in rocky nearshore communities, responsible for shaping the character of the habitat through their grazing activities. Important prey item for wolf eels and sea otters.

General Location or Habitat Association of Resource: Sea urchins populate the kelp beds off Point Roberts and along the western shorelines of Lummi, Sinclair, Cypress, Guemes, Burrows, Allen, and Fidalgo Islands. Urchins are found from the lower intertidal to depths of 125 m but the highest densities are found at depths less than 30 m. Juveniles are found in adult habitat and require the adults presence to survive.

Seasonal Sensitivity: Spawning occurs during the spring followed by a planktonic larval phase that lasts from 60 to 130 days. Adults are susceptible to oil exposure via ingestion of contaminated marine algae, particularly kelp. Highest risk of this type of exposure is from April to November.

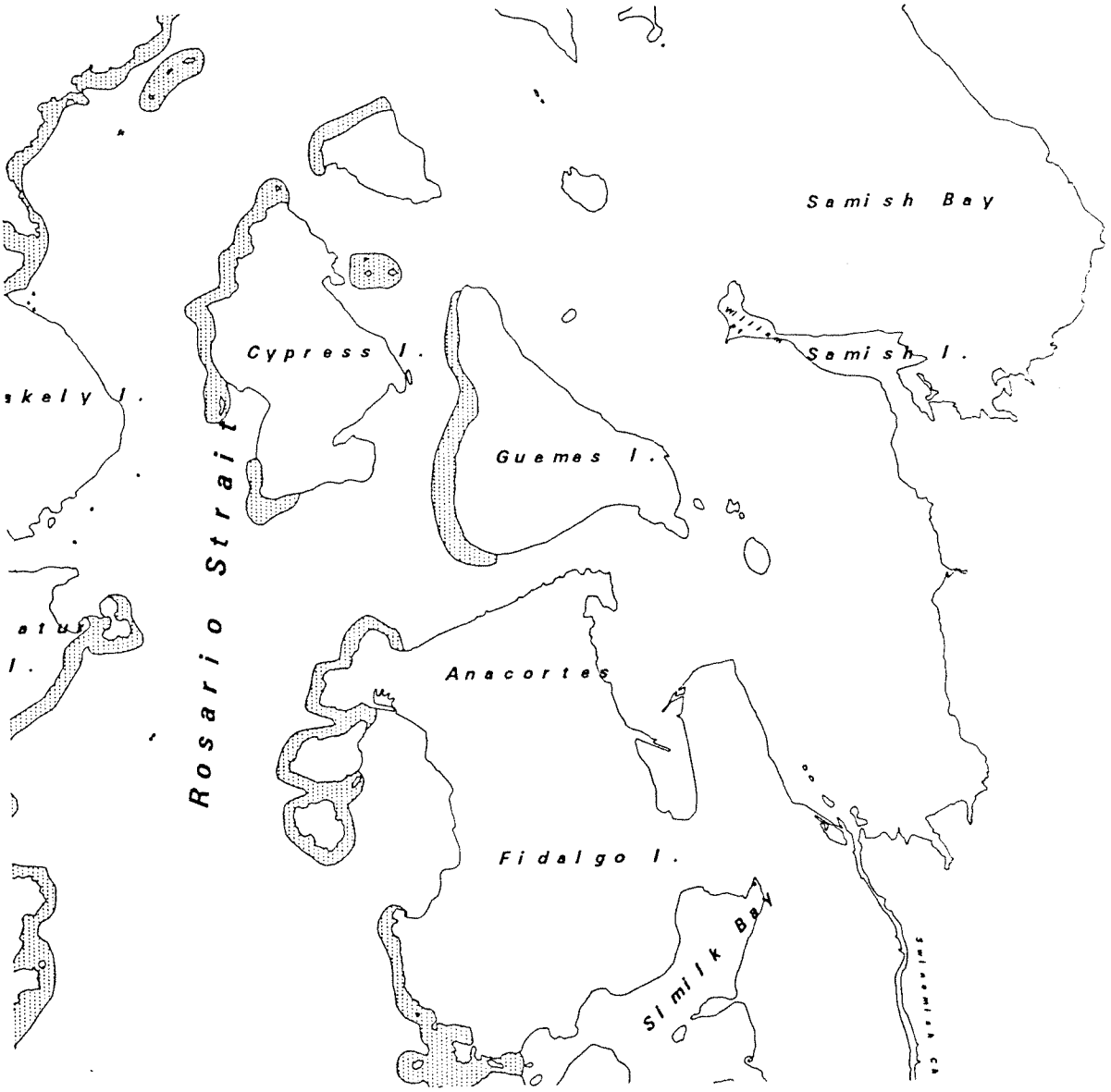
Recommended Protection Strategy: Prevent oil from contaminating nearshore kelp beds. Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

North Puget Sound Shellfish Resources
Skagit County



Urchin

USGS Shoreline

Meters

0 4000 8000

Source: Washington Department of Fisheries
This map does not offer complete information on the distribution of fish and shellfish resources. Comprehensive inventories have not been completed in all areas.

Draft - June 16, 1993

North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Octopus (*Octopus dofleini*)

Resource Information Mapped: Documented octopus habitat.

Resource Use: Harvested in commercial, recreational, and subsistence fisheries.

General Location or Habitat Association of Resource: Octopus live in caves or dens from the lower intertidal to the subtidal zones.

Seasonal Sensitivity: The portion of the population inhabiting the lower intertidal and shallow subtidal zone would be subject to exposure during extreme low tides throughout the year. Octopus are also susceptible to exposure via contaminated prey, particularly clams and crab.

Recommended Protection Strategy: Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

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North Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Geoduck Clams (*Panope abrupta*)

Resource Information Mapped: Geoduck clam distribution (commercial quantities).

Resource Use: Human; Geoducks support a large commercial and recreational fisheries. Non human; Geoducks are fed upon by snails, pandalid shrimp, rock crab, English sole, sand sole, rock sole, starry flounder, starfish, and sea otters.

General Location or Habitat Association of Resource: Geoducks are found along the east sides of Lummi and Eliza Islands and inhabit depths from +1 to -110 m MLLW. Preferred substrate is stable mud and sand.

Seasonal Sensitivity: Sensitivity would be highest during the spawning and larval period from April through August (peak May - July).

Recommended Protection Strategy: Utilize beach clean up techniques which do not transport oil into the subtidal zone.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.